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Circular No. 763
November 1947 • Washington, D. C.
UNITED STATES DEPARTMENT OF AGRICULTURE

Relative Milk Production of Cows in Pen Barns and Stanchion Barns

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INTRODUCTION

In recent years there has been considerable interest and some controversy concerning the merits of two general systems of housing dairy cows. One system involves the use of the conventional stanchion-type barn. When this system is employed the cows are confined in stanchions at all times, although in some cases they may be taken to a separate barn to be milked.

The other system involves the use of a barn or shelter of some sort where the cows can run loose and rest or "loaf" between the times when they are being fed and milked in another barn. The floor of the shelter or loafing barn usually is of earth on which bedding is placed. This provides a soft place for the cows to stand or lie down on. The floor of the stanchion-type barn is usually of concrete or other hard material.

In 1928 the senior author designed a barn for housing dairy cows which subsequently became known as a pen barn. It was a modification of the loafing or lounging barn, or open-shed system, that had

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long been used on the Pacific coast. In such barns the cows run loose as a group. The pen barn differs from the usual loafing or lounging barns in that it has a feed alley through the center and the area on each side of the central alley is divided into a number of small pens. A few cows can run loose in each pen. There are rigid wooden stanchions and mangers along each side of the feed alley where, if desired, the cows can be fastened and fed hay and silage. A gate from each pen to the central alley facilitates moving the cows to the separate barn in which they are milked and fed grain. (See fig. 1.)

Pen barns patterned after the original design have been in use for a number of years at several field stations maintained by the Bureau of Dairy Industry. At first each pen was made to accommodate 4 cows, but when it was observed that the cows did not use about 2 feet of space on each side of each partition, with a consequent waste of bedding and space, the number of partitions was reduced and the size of each pen was increased sufficiently to accommodate 8 or even 12 cows.

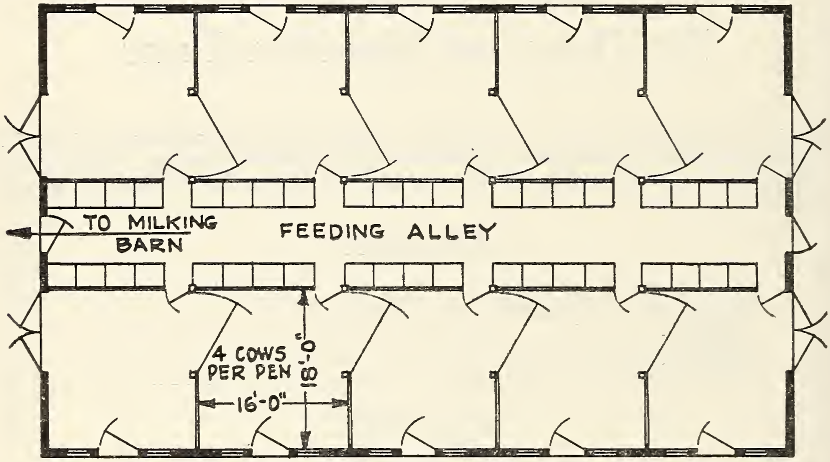

Figure 1.—Floor plan of the pen barn used at the Bureau of Dairy Industry field stations.

At the Bureau's field stations, fresh bedding is added daily to the pens and the tramping of the cows compacts the manure and bedding tightly. Often it may be allowed to accumulate to a depth of 2 or 2½ feet, or until a convenient time is found for hauling it to the field. The accumulated material forms a soft, warm bed for the cows, and as long as enough bedding is used they keep fully as clean as cows in the stanchion barns. Urine is absorbed rapidly and there is far less scattering of manure and urine, by swinging tails, in the pen barns than in the stanchion barns.

This circular gives the results of an experiment conducted by the Bureau of Dairy Industry at its Huntley, Mont., field station to determine the relative milk and butterfat production of cows housed in a pen barn and in a stanchion barn, and discusses some of the problems that should be considered in deciding which system of housing to use.

EXPERIMENT AT THE HUNTLEY, MONT., STATION

Methods

A pen barn was built at the Huntley station in 1930. Since then it has been the practice at this station to keep the yearling heifers in an open shed and, when they freshen with their first calves, to move them to the pen barn where they are put on official test. While they are on test they are allowed to run loose, by small groups, in the pens. They are permitted to eat alfalfa hay and corn silage at will, and are given some pasturage in season. A grain mixture is fed at the rate of 1 pound for each 3 pounds of milk produced, and they are milked three times a day.

After the first-calf heifers complete their official records they are available for use in feeding experiments. Cows on feeding experiments are housed in the stanchion barn because the mangers are divided and each cow can be fed individually.

Few cows at this station are ever moved to the stanchion barn until their second lactation period. It was observed that when the cows were put in stanchions for the first time, many of them became uneasy and did not lie down or rest comfortably. Often they became lame and developed swellings on the legs and sides, and occasionally they did not appear to produce up to the level expected of them.

The stalls are of standard design and the platforms are 3 feet 6 inches wide and 5 feet 3 inches long. A standard alinement device is used to adjust the stalls to large or small cows.

In 1940 an experiment was planned to determine the relative effects of the pen barn and the stanchion barn system of housing dairy cows on their level of milk production. The seven heifers that were then on official test in the pen barn were to be kept in the stanchion barn during subsequent lactations and handled under the same conditions of feeding and milking as when they were in the pen barn. At the same time seven other cows were being carried on a feeding experiment in the stanchion barn. They were getting a limited amount of grain (approximately 1 pound of grain for each 9 pounds of milk produced) and they were to be kept on the same ration during subsequent lactation periods but housed in the pen barn.

Records were also to be kept of illness, lameness, and any other condition that might affect the production of the cows in both groups.

Results

Table 1 shows the production records of the seven cows that were on a full-grain ration (1 pound of grain for each 3 pounds of milk produced), both when they were housed in the pen barn and when they were housed in the stanchion barn. For several of the cows more than one record was kept, as shown in table 1. The actual records are given but, because of the difference in the ages of the cows when they started their various lactations, all records have also been calculated to a mature-equivalent basis.

The cows on the full-grain ration produced at a high level, both in the pen barn and in the stanchion barn, but their production was decidedly higher in the pen barn. On a mature-equivalent basis, the average production was approximately 19 percent more milk and 18 percent

TABLE 1.—*Comparative production of 7 cows (on a full-grain ration) when kept in a pen barn and when kept in a stanchion barn*

PRODUCTION WHEN KEPT IN PEN BARN

Cow No.	Age when record began		Actual production		Production calculated to mature basis [1]		Some conditions that affected production
			Milk	Butterfat	Milk	Butterfat	
	Yr.	*Mo.*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	
386	2	5	16, 299	596	21, 352	781	Mastitis, 1 attack; off feed few days.
387	2	4	13, 802	554	18, 357	737	Mastitis, 1 attack.
388	2	2	14, 772	534	20, 090	726	Normal.
393	2	4	12, 330	464	16, 399	617	Do.
	5	0	15, 530	631	16, 151	656	Do.
397	2	3	11, 354	457	15, 328	617	Mastititis, 1 attack.
	4	10	12, 516	515	13, 142	541	Normal.
407	2	1	15, 822	525	21, 834	725	Do.
412	2	1	16, 638	550	22, 960	759	Mastitis, 3 attacks.
Average	2	10	14, 340	536	18, 402	684	Mastitis, 6 attacks by 4 cows.
PRODUCTION WHEN KEPT IN STANCHION BARN							
386	3	9	14, 781	544	16, 554	609	Lame first 2 months.
	4	10	15, 219	538	15, 980	565	Do.
387	3	6	11, 588	456	13, 326	524	Sore feet first 3 months; 6 attacks of mastitis.
	4	9	17, 386	673	18, 255	707	Normal.
388	3	5	13, 510	507	15, 672	588	Stiff first month; 4 attacks of mastitis.
	4	8	11, 948	440	12, 665	466	Normal.
393	3	6	14, 687	595	16, 890	684	Sore feet first 3 months; stiff hind legs most of lactation.
397	3	6	10, 750	419	12, 363	482	Normal.
407	4	0	15, 495	545	17, 045	600	Sore feet; stiff first 4 months; off feed once.
412	3	6	14, 040	506	16, 146	582	Lame during first month.
Average	3	11	13, 940	522	15, 490	581	Mastitis, 10 attacks by 2 cows; 7 cows had sore feet.

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[1] 6 of the 7 cows made better records in the pen barn then in the stanchion barn. Average production for the group (mature basis) was higher in the pen barn by 2,912 pounds of milk (18.8 percent) and 103 pounds of butterfat (17.7 percent).

TABLE 2.—*Comparative production of 7 cows (on a limited-grain ration) when kept in a stanchion barn and when kept in a pen barn*

Cow No.	Age when record began		Actual production		Production calculated to mature basis [1]		Some conditions that affected production
			Milk	Butterfat	Milk	Butterfat	
	Yr.	*Mo.*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	
PRODUCTION WHEN KEPT IN STANCHION BARN							
96	7	4	14, 750	492	14, 750	492	1 quarter swollen 30 days.
	8	8	15, 034	514	15, 034	514	Milk fever; lame first month; would seldom lie down.
97	7	2	8, 220	314	8, 220	314	Would not lie down much first few months.
	8	6	10, 543	414	10, 543	414	Normal.
304	7	10	16, 523	550	16, 523	550	Would not lie down much first few months.
307	7	0	13, 052	451	13, 052	451	Ends of teats frozen; would not lie down often.
343	5	2	12, 740	439	13, 122	452	Lame throughout; would lie down when turned out of barn.
346	4	10	12, 711	447	13, 347	469	1 severe attack of mastitis.
356	4	1	14, 384	555	15, 679	605	Lame and stiff first 4 months; would lie down when turned out.
Average	6	9	13, 106	464	13, 363	473	Cows lame during 6 of 9 lactations; did not lie down normally.
PRODUCTION WHEN KEPT IN PEN BARN							
96	9	10	15, 316	540	15, 316	540	3 attacks of mastitis.
97	9	10	9, 721	368	9, 721	368	2 attacks of mastitis.
304	9	0	16, 171	531	16, 171	531	Normal.
307	8	2	14, 905	504	14, 905	504	Do.
343	6	5	15, 852	550	15, 852	550	Lame shoulder first 2 months.
	7	8	12, 936	434	12, 936	434	Normal.
346	6	0	13, 809	494	13, 809	494	7 attacks of mastitis; infected knee ninth month.
356	5	4	14, 327	502	14, 389	504	1 attack of mastitis.
	6	7	15, 768	584	15, 768	584	Normal.
Average	7	8	14, 312	501	14, 319	501	13 attacks of mastitis in 4 cows, 1 cow lame.

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[1] 4 of the 7 cows made better records in the pen barn than in the stanchion barn. Average production for the group (mature basis) was higher in the pen barn by 956 pounds of milk (7 percent) and 28 pounds of butterfat (6 percent).

more butterfat per cow in the pen barn than in the stanchion barn. Six of the seven cows made better records in the pen barn.

These were the first records that these cows had made when kept in stanchions. The fact that they had spent their first lactation period in the pen barn and that they were not accustomed to stanchion stalls may have been partly responsible for their lower production in the stanchion barn. However, of the three cows that had two successive lactation periods in the stanchion barn—two produced less and one produced more during the second lactation. Cow 387 produced 183 pounds more butterfat in her second lactation, when her condition was normal, than in the preceding lactation when she suffered from sore feet and had six attacks of mastitis.

When kept in the pen barn the cows consumed on an average 7,296 pounds of total digestible nutrients as compared with an average of 6,950 pounds when they were kept in the stanchion barn. They averaged 21 days more on pasture when kept in the stanchion barn. The average gain in weight was 176 pounds in the pen barn as compared with an average gain of 135 pounds in the stanchion barn.

Only one cow in the stanchion barn escaped having sore feet or lameness during the first lactation, but two of the three cows that were housed in the stanchion barn for two successive lactations had no trouble of this sort during the second lactation. The sore feet were apparently caused by standing on the hard concrete floor, since there was no evidence of infection such as foot rot or foul foot. These cows were not troubled with sore feet or lameness when they were housed in the pen barn, but two of them had attacks of mastitis in the pen barn and two had attacks of mastitis in the stanchion barn.

Table 2 shows the production records of the seven cows that were on a limited-grain ration (1 pound of grain for each 9 pounds of milk produced) when they were in the stanchion barn and later when they were in the pen barn. They were not on pasture during the course of the experiment. Five of the seven cows were of mature age when they started on the test.

This group of cows, being on a limited-grain ration without pasture, was producing at a lower level than the other group, both in the stanchion barn and in the pen barn. Their average production was higher in the pen barn than in the stanchion barn, but the difference was much less than in the case of the group on the full-grain ration. On the average they produced 7 percent more milk and 6 percent more butterfat in the pen barn; four of the seven cows made better records in the pen barn than in the stanchion barn.

The cows consumed somewhat more feed when they were kept in the pen barn. The nutrient consumption averaged 9,253 pounds in the pen barn as compared with an average of 7,805 pounds in the stanchion barn. The average gain in body weight was 119 pounds in the pen barn as compared with only 41 pounds in the stanchion barn.

In this group mastitis was more general while the cows were in the pen barn, 4 of the 7 suffering from 13 cases of mastitis in the pen barn. One of the most persistent cases was that of cow 346 which had had a severe attack in a previous lactation in the stanchion barn.

Lameness in this group, as in the first group, was more general in the stanchion barn. Many of the cows refused to lie down in the stalls early in the lactation period, but they would lie down immediately after being turned out into the lots.

Although both groups suffered from sore feet and lameness in the stanchion barn, in most cases the condition was not apparent after the first few months, only a few cases persisting throughout lactation. Both groups suffered more attacks of mastitis while in the pen barn. Mastitis was prevalent in the herd during the experiment, however, and the more frequent occurrence of the disease in the pen barn is not believed to have been the result of any condition there.

SOME PRACTICAL CONSIDERATIONS

The results of the experiment at the Huntley station indicate that cows will produce more milk and butterfat when they are permitted to run loose in a lounging or pen barn than when they are confined in stanchions. The difference in production apparently will depend somewhat on the level of feeding. The greater freedom and comfort of the cows in the pen barn at Huntley, as compared with that of the cows confined in stanchions and on hard floors, probably accounted for the higher production in the pen barn.

There are other points than the comfort of the cows, however, that should be considered in deciding which system to use. In colder climates, lounging barns require 15 to 25 pounds of bedding per cow per day as compared with 8 to 12 pounds for stall barns. Where there is a lack of straw or other suitable bedding material, stall barns are used almost exclusively. In some areas, milk-market regulations oppose the use of the lounging or pen barn system because manure is not removed daily.

With both systems provision must be made for storing feed and bedding and for accommodating calves, heifers, dry cows, calving cows, and usually a bull. A milk house must also be provided if more than a few cows are kept and it should be close to the milking stable, preferably attached to the stable if regulations permit, but not opening into it. In cold climates, when all costs are considered there is probably little difference in the total cost of the buildings required by the two systems or in the total cost of labor.

Where the weather is mild or dry, little shelter is required for dairy cows and only small quantities of feed and bedding need be stored. Under such conditions the milking room and lounging barn combination has an advantage both from the standpoint of cost and adaptability to changes in the size of the herd.[3]

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[3] For a more complete discussion of systems of stabling dairy cows see MILLER, T. A. H.; EDICK, G. L.; ASHBY, W.; DAWSON, J. R.; and WOODWARD, T. E. FUNCTIONAL REQUIREMENTS IN DESIGNING DAIRY BARNS. U. S. Dept. of Agr. Cir. 722, 24 pp., illus. 1945.

U. S. GOVERNMENT PRINTING OFFICE: 1947